

The following is a summary of the deposition testimony describing the use of the buildings at the Eagle Zinc site, along with reference to the XRF sample points at or near those buildings:

DODD (8) Eagle Picher mined the ore in northern Illinois, shipped it to Galena, Kansas where it was purified, and then sent to Hillsboro as a raw material.

DODD (37-39) I never heard of a zinc product that didn't contain lead. Cadmium and zinc exist together in nature and so you never get completely rid of it. Iron, too. We intended to eliminate arsenic from our oxide and our processes to the best metallurgic degree possible. In the case of the American process operation (rotary furnaces) in which we purified the ore, we drove it off during the purification process at the plant down in Kansas where we prepared our feed.

Northern end – sublead building

Eagle Picher started the construction of a sublimed lead plant there in 1932 because they planned on expansion of that product from the Joplin, Missouri plant. Business deteriorated to the extent that they simply stopped construction on the plant itself and just left the buildings unfinished. Later on they were roofed and made weather-tight and were used for storage for Eagle Picher. Dodd 13.

Sub lead building was used strictly for storage of zinc oxide. We stored paper bags out there and we stored excess parts for rotary furnace, refineries and what have you. Moler 11.

Muffle furnace (XRF 26, 27, 52, 65)

Muffle furnace was completed in 1954. It consists of 2 reverberatory furnaces with an intervening ceramic arch separating the combustion gases from the charge material. Metallic zinc or metallic zinc scrap was used and the furnace boiled the zinc off in vapor form and oxidized it to make zinc oxide. It was heated with natural gas. Dodd 14-15.

The muffle furnace used the French process which makes oxide from metallic zinc or scrap like carburetors, grills, etc. It ran at a temperature of 2,400 to 3,000 degrees. It had a firing place for charge scrap or material, and the zinc melts and goes over to another part of the furnace. From there it went to a section where fumes came out into a riser. As the fumes hit that riser, they mix with the air and convert to zinc oxide. The zinc oxide from that point would go over into a baghouse. And from the baghouse it would be brought up to the refinery where 90 – 95 percent of the time, we would pack it and sell it. Some times we used it in other product. Moler 12-13.

The inputs were galvanized zinc, scrap zinc, high-grade zinc, and some drosses. Moler 13.

The furnace generated dross from the melting unit (called muffle dross) and residue metal which was the nonvolatile part of the zinc scrap that was furnaced. Dodd 16.

Eagle Picher sold the residue metal into the trade for its aluminum content and processed some to make a crude oxide. Metal dross “inventory” was basically left lying on the ground either around the muffle furnace building itself or in a storage area due west of the muffle furnace building. Dodd 16-17.

The byproducts were muffle dross, and iron and steel that came out of the carburetors, zinc and what have you. Muffle dross was a gray zinc powder. It may have 5-10 percent zinc in it depending on how well they strained it before they pulled it out of the furnace. When it began to cool it would be maybe the size of a dime maybe or a little bit will chunk, but there was a lot of powder in it. We would screen the dross across a trommel screen, and the dross would come out under it and the metals would come out on the ends. The metals were sold to the junk dealer. Some of the dross was sold, too. They'd screen it and take it to the field. When they didn't sell it they'd pile it out there until they could. Moler 13-15.

The muffle furnace also produced iron, and they'd stack it and get a boxcar or gondola car to load it out. Moler 12-14.

Dross is a little bit different. It's dusty, it's dry. It's dry to begin with. Moler 36.

Weatherill building (#4 – XRF 21, 24, 25, 32, 33, 44; #3 – XRF 18-23; #1 – XRF 15, 17, 18, 43)

The Weatherill building originally contained the four Weatherill furnaces. They were a stylized type of reverberatory furnace constructed of brick sides and top, but the bottom of the furnace consisted of a series of grates made of cast iron. The principle of the operation was to mix coal with zinc ore, spread it on the grate and then supply combustion air from a blower through the grate upward and the coal then would burn, creating the heat to carry forward the reduction of the zinc ore. Dodd 19.

The Weatherill furnaces also generated a residue called clinker. Depending upon on what kind of ore was used and how the furnace was operated, the residue could have different physical forms; but, it would be the same general product. Part of the clinker was sold -- a big share went to Hegeler Zinc in the '50s -- and the remainder of it was generally processed by the company at Henrietta, Oklahoma in the Waelz kiln, which would recover the zinc values. Dodd 20-21.

The Weatherill furnace was a hand-fired furnace. They mixed coal, whatever type they use with the ore, and shoveled it in there by hand. The charge was mixed in the mix room and put up into a hopper, where they filled the charge cars that would go to one furnace. There were several fires you shoveled into, and as one would burn out you break it up and the other one would be burning. You didn't charge them all at the same time. Moler 27-28.

The Weatherill furnace produced a clinker that you'd break up with a bar, and they just pulled them out and used a chute at the end of the furnace that dropped the clinker down into a hopper downstairs and they could haul it out into the field. The clinker was a small gray mash because you break it up and it would be in chunks; but as it cooled it deteriorated and broke into smaller particles and some fines. Moler 28-30.

Eventually, the Weatherill furnaces were all replaced by rotary kilns. The number one rotary was built in 1940. The number three kiln was built around 1960 and number four, which is in that same building, was built in approximately 1973. Dodd 21.

The rotary kilns would simply melt or admix reduction fuel (anthracite coal) with the zinc-bearing material and drop it into one end of the kiln. The kiln has a sufficient slope that the material works its way down through the kiln and the residue is just discharged at the other end. The zinc-bearing material would be purified zinc ore and recirculated zinc oxide from the combustion chamber in the cooling system. Dodd 23.

The rotary furnace is charged with anthracite coal and zinc products (zinc ore or a high zinc dross -- we called them nodules). They're mixed into a batch we call the feed. Feed is hauled over to a feed hopper at the rotary furnace. From the feed hopper it goes into a drum which runs at a high temperature to dissolve it and convert it into zinc oxide fumes. It goes into the furnace, and it's hot enough that it goes into a discharge chamber at the end of the furnace. It is a brick structure about about 30 feet long and maybe 20 feet tall, and 10 or 15 feet wide. The first eight foot of it or so is called a discharge chamber; and, fumes come out of the furnace and go up over this discharge chamber and there's air slots at the top of it where you can hit it with air in order to convert it to different types of oxide. Then it goes into the combustion chamber and from the combustion chamber, the heavies (an off grade of oxide) fall out. From that point it would go into a trail, which acts as a cooling area and they convert into zinc oxide. And from that it goes into a baghouse. Moler 18-20.

The residue that came out of the end of the kiln was the gangue from the ore, the ash from the coal and the unreduced coal and the unrecovered zinc. The residue as it came out was water quenched. Because it also contained unused coal it was stockpiled. Over the years it was piled in various places, mostly on the west side of the plant near the road. Dodd 23-24.

A residue came out of the north side of the rotary furnace into a quench tank of water to cool it. When it was cooled they'd haul it with a truck over to the mix room. It come from the furnace and was generated mostly from anthracite coal so it looked black. We'd take it over and screen it at the mix room, and if we could use it back in the furnace we would mix it back in with the coal. If we couldn't then it was stored over in the -- a rotary pile which would be in the area of the CPH-9 and CPH-6. Moler 25-26.

The rotary furnace cleanout was hardened slag and frequently required a jackhammer to break up the solid slag so it could be removed from the kiln. A determination was made by assay as to whether or not there was enough zinc content in the furnace cleanout to crush it and recirculate it through the charge. If it wasn't useable in that manner it was put in a pile someplace in the plant. Dodd 24-27.

The rotary furnaces generated a slag. Zinc would build up in the rotary kiln itself or in the discharge chamber. It was just air-hammered out in chunks. It was zinc-bearing and high in iron. We tried to keep the high-grade zinc as much as possible, take it over to the crusher, crush it up and run it back through the furnace. The slag cleaned from the kiln that had lower zinc content was taken out and stored at the south end. Moler 22.

Kilns 1, 2 and 4 were operated in a similar manner throughout their existence. The number three kiln was used for a multitude of different, varying operations over the period of time. The majority of the residue from #3 is stockpiled in the area that you referred to as RR2-11. They were running the muffle dross through the #3 furnace so the residue was not like the rotary residue. There was probably not as much excess carbon, and the gangue material in the feed to number three furnace would have some copper in it; and, we always felt that sooner or later this pile would be worth something for copper. Dodd 26, 61-63.

Block one rotary, was strictly a zinc oxide producing rotary. It was smaller than block two, the one by the road.

Block four was a bigger kiln. It was a long kiln and it kept slagging up. We just took and loaded this material into a truck at the back of the residue where it came out of the quench tank and it's wet. So we would back our truck up to the ramp and take and put the residue in there and let the water run back down into the residue because it had a circulating pump that pumped all the time in there. Moler 30-31.

#3 block was an experimental furnace. We ran it on different things to see if they could make different products on it. Instead of using nodule zinc we'd use some dross zinc or something like that. It was strictly experimental. Moler 18-20, 30.

We used nodular ore to begin with at Eagle Picher time. During Sherwin-Williams' time we switched over and used some Decca ore that was brought in from overseas. Sherwin-Williams also may have used slab zinc. Moler 91.

Mix room (XRF 14)

The mix room contained the hoppers for -- for feed and for coal and -- and the mixing facility. Dodd 19.

We'd take the heavies back to the mix room, mix it in with the charge and put it back through again. Moler 22.

Buildings 44 and 45 (XRF 30, 31)

These buildings contained the carbon recovery plant and the crushing plant in the southernmost building (44). Building 45 was the northern building, and it was mainly a storage area. Dodd 27-28.

The carbon recovery plant was basically a two cell, Denver jig plant in which the coal was separated from the remainder of the rotary furnace residue. The product recovered was anthracite that was recirculated in the charge. There was also a "hutch" or middling product out of the jig. Hutch would have been someplace in the southwest of the building where the carbon recovery plant was. Dodd 28-30.

The crusher was located west of the furnaces. Cleanout material from the rotary furnaces that had high zinc content would be crushed and reused in the process. Later Building 45 ended up being just a storeroom; but when Eagle Picher ran it, it was a carbon recovery plant. They took the screened residue, and ran it through a process that would separate the heavies and the coal. On one end of it would come zinc-bearing materials, which we could run back through the furnace as zinc. On the other end it came out carbon, which we could use to mix in with our other anthracite coal and run it back through the furnace. It was a reclaiming process. The carbon recovery process also generated hutch, which was a gray granular product that was high in iron, for one thing, with small grains. Moler 22-23, 31-33.

No. 2 Furnace (XRF 1-5)

Same operation as kilns 1 & 4. Dodd 22, Moler 18.

Lab (?)

We don't have chemicals out at the plant other than what we assay with; and they weren't spilled. They were diluted and put down the drain. Moler 93.

Baghouses (XRF 0, 34, 8-12, 61-64, 54-56)

The zinc oxide from the furnaces would go over into a baghouse. And from the baghouse it would be brought up to the refinery where 90 – 95 percent of the time, we would pack it and sell it. Moler 13.

Southwest corner

This is the area where the original residue from the zinc metal furnaces was stored. There was a large tonnage of residue from the zinc metal furnaces there when I first came to the Hillsboro plant,. The zinc metal furnace operated from the time the plant was built in 1913 or 1914 until 1935. Lanyon built this plant to supply zinc for cartridge brass for World War I. Cartridge brass is 70% copper/30% zinc. Business simply was so poor during the depression years that the zinc metal plant and the acid plant were shut down. Eagle Picher shipped out those residues -- the last of them were shipped down to our Henrietta, Oklahoma plant for recovery of the zinc and germanium content. Those shipments probably ended in the 1950s. There was a dam at the property line, so that the water could be impounded and it was used for cooling of the zinc furnaces. Dodd 58-60.

Lanyon used the old horizontal zinc furnace. The feedstock was Zinc ore and coal. The ore came from the old TriState District down at Joplin. Dodd 65-66.

The material in the area looks like a rotary residue. It has sat there and hardened and chunked over the years. It just looked like a gray granular product that normally had fines in it to begin with or dust, but over the years it's just conglomerated and hardened and it's all together. Moler 34-35.

I imagine it was slag from the rotary furnace. Moler 95.

Refinery building (XRF 5, 7)

The plant made leaded zinc oxide until 1957. It brought in white lead from another plant and blended it with our lead-free zinc oxide in the refinery building. Dodd 30-31.

From the baghouse it goes into a weightometer room and it goes up an elevator over into the refinery into what we call the raw bins and the raw bins, that's another process from that point on. Moler 19.